Beyond technologies: the politics of energy transitions in rentier states

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CHAPTER 2

THE DOMINO EFFECTS OF ENERGY DEFICITS: THE RISE OF LOW CARBON TECHNOLOGIES IN NIGERIA

"Nigeria currently loses 150,000 barrels a day to oil theft, the equivalent of USD5 billion a year. On top of that, regulatory uncertainty—the result of a seemingly permanently stalled Petroleum Industry Bill—has led to delays in investment decisions."

Wall Street Journal, 14 October 2014

2.1 INTRODUCTION

In the last decade, the sub-Saharan Africa region has recorded more than 30% new oil and gas discoveries, with Nigeria accounting for the highest percentage of these oil resources (IEA, 2014). Currently, Nigeria is the second largest economy in Africa, with vast energy resources, including an estimated 37.1 million barrels of crude oil reserves and over 5.1 trillion cubic metres of natural gas (BP, 2014). Despite these seemingly vast oil and gas resources, Nigeria has not been able to meet her energy demands, with over 55% of the population lacking access to electricity (IEA, 2014). Even with Nigeria's economic growth in the last three decades from a low-income country to a middle-income country, limited access to reliable electricity and modern energy services for cooking has undermined its efforts towards becoming an industrialised nation. Nigeria's power crisis in the last 50 years has significantly increased with its rapid urbanisation and explosive population growth (currently at over 200 million), with a current growth rate projected to be between 2.5 and 2.7% annually (REN21, 2014a). Access to non-harmful cooking fuels is limited thus about 75% of the population rely on traditional biomass (charcoal and sawdust) for cooking and household needs. This exposure to open fire, with fumes, results in an annual death of over 69,000 per year with other severe health risks (GIZ, 2013; REN21, 2014a). National energy access rate further conceals the disparities between urban and rural energy access in Nigeria. Statistics show that more than 65% of people in rural areas in Nigeria do not have grid connected electricity while 60% of the population in urban areas have grid coverage (NESP, 2014). The gap in connectivity lies in the over-centralised grid infrastructure system currently operated in Nigeria, which by design benefits the urban population more than the rural population.

Today, the critical shortage of electricity infrastructure in Nigeria has considerably weakened efforts to realise more rapid economic and social development. Even in urban areas with grid coverage, a constant power supply is not guaranteed, necessitating heavy reliance on expensive fossil fuel dependent generators. High technical and commercial losses—estimated at 17.3% in 2014 have also contributed to a widening gap between energy demand and generation (REN21, 2014a). These numerous technical and commercial losses have led to an increasing energy cost. The high-cost component entrenches poverty in many rural households as this disproportionately affects their meagre income. For example, a poor woman in rural Nigeria who spends her income on kerosene and candles pays 80 times more per unit for energy consumption than her counterpart in Amsterdam (Africa Progress Panel, 2015).

One possible reason is that she is less visible to political decision makers in comparison to her counterparts in urban centres with high interest and lobbying groups. A recent report from the Lagos State Electricity Board (LSEB) corroborates this argument and shows that on an average, Lagosians who earn less than USD 2 per day power themselves via self-energy generation at the cost of USD0.24 per kWh, which is almost four times the cost of grid supplied electricity (LSEB, 2013). Conspicuously the overall effect of these energy challenges is its influence on global rankings on doing business in Nigeria.[4] Mostly, Investors are quick to point to the bureaucratic bottlenecks encountered in obtaining a permanent electricity connection. Going by estimates, for a typical business to get connected to the national grid, it would cost 478% of income per capita and take approximately 260 days (KPMG, 2013; World Bank, 2012). Perhaps, changing the status quo would be critical poverty reduction strategy.

At the moment, evidence suggests that lack of energy access is tied to financial, economic, health and environmental poverty in Nigeria. However, the provision of electricity can substantially change these negative factors as empirical evidence from NEPAD, (2009); UNECA, (2011); and WHO, (2009) reveals that energy access does have positive domino effects on child mortality rates; education and communication while fostering societal productivity. It is clear that Nigeria's ever-increasing population[5] and its rapid urbanisation are currently placing a strain on its already weak power and electricity infrastructure.

This has prompted the need to harness its numerous renewable energy resources (Ley, Gaines, & Ghatikar, 2014). Not only will renewable energy technologies potentially contribute to the expansion of power generation, but it will also perhaps foster a rapid development of small and medium scale businesses across Nigeria (Moner-girona, 2008; Oluwole, Olatunji, & Ibikunle, 2012). To understand how renewable energy development is positioned in Nigeria's energy architecture, the thesis examines the evolution and development of Nigeria's energy sector.

4. Nigeria is ranked 187 in the doing business index
5. Nigeria has been projected to be the most populous country by 2050

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TABLE 2.1 Doing business in Nigeria and Investor risk map 2016

Indicators	Rank	Risk Type	Risk Rating
Starting a business	139	Country risk	High
Dealing with construction permits	135	Risk of doing business	Very high
Getting electricity	182	Banking sector vulnerability	Low
Registering property	181	Legal and regulatory risk	Very high
Getting credit	59	Exchange transfer risk	High
Protecting minority investors	20	Political interference risk	High
Paying taxes	181	Sovereign non-payment risk	Medium high
Trading across borders	182	Supply chain disruption risk	High
Enforcing contracts	143	Political violence risk	High
Resolving insolvency	143		

Source: AEON risk map and (World Bank, 2016)

TABLE 2.2 Economic and energy indicators

Indicators	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
GDP growth rate %	6.5	8.2	6.8	6.3	6.9	7.8	4.9	4.3	5.4	6.3
GDP Per capita (USD)	847.4	1,014.7	1,205.2	1,376.9	1,092	2,315	2,514.1	2,739.9	2,979.8	3,202.3
Energy Intensity	0.157	0.157	0.157							
Energy consumption per capita (kgoe)	132.6	740.9	747.1	749.2	718.1	752.7	775.0	794.9		
Electricity consumption per capita (kWh)	181.4	111.1	138.1	126.5	119.9	135.6	149.3	155.9		

Source: World Bank database, 2015

2.2 THE DEVELOPMENT OF NIGERIA'S ENERGY SECTOR: A HISTORICAL PERSPECTIVE

The first ever electricity generation took place in 1896, which led to the deployment of a 60kW power generator in the Lagos colony (Okoro & Chikuni, 2007). The colonial administrators mostly maintained this infrastructure, and by 1950, the Niger Dam Authority was established to oversee the power sector. The NDA, an offshoot of a legislative act, oversaw the construction, maintenance and generation of electricity from the river-Niger (Dayo, 2008) while other companies like the Nigerian Electricity Company (NESCO) were given licenses to generate energy in other parts of Nigeria. Also, a central institution known as the Electricity Corporation of Nigeria (ECN) was created to supply and distribute power generated by the Niger Dam Authority (KPMG, 2013; Okoro & Chikuni, 2007). By 1956, Nigeria discovered crude oil resources and began to actively develop the oil and gas sector for energy generation. Soon after independence in 1960, multinational oil corporations (MOCs) gained control of the exploration, production and competencies of the oil sector. Subsequently, the Nigerian government enacted the 1969 Petroleum Act (Heller, 2009; Ikelegbe, 2006; Watts, 2007). The petroleum act granted oil exploration, licensing and production rights to enterprises owned by Nigerian citizens or incorporated in Nigeria and gave the Nigerian government rights to part ownership of new oil concessions (Omorogbe, 2001). By 1972, the operations of the Niger Dam Authority and the Electricity Corporation of Nigeria were merged for optimisation into a new company known as the Nigerian Electricity Power Authority (NEPA) (Okoro & Chikuni, 2007). NEPA focused on creating an energy mix, which involved the use of oil, gas, coal and hydroelectric sources for power generation. However as Nigeria's population increased over the years, NEPA's energy production and supply capacities dwindled, leaving a large quota of the population un-electrified (Idris, Kura, Ahmed, & Abba, 2013). From the early 1990s onward, investments in the electricity sector diminished, limited infrastructural capacities were added and budgetary allocations were significantly reduced (Cervigni et al., 2013).

The above challenges explain the reason for the existence of a high percentage of people without electricity access in Nigeria. Putting this into perspective, recent estimates reveal that due to obsolete power infrastructure and inadequate maintenance, available capacity in grid network fell from 4000 megawatts (MW) in 2011 to 1200 MW in 2014 (Ley et al., 2014). As of 2014, the share of electricity in final energy consumption was below 2% with biomass (fuelwood and sawdust) accounting for over 80% (REN21, 2014a).

2.3 RESOURCES, INFRASTRUCTURE AND INSTITUTIONS IN NIGERIA'S ENERGY SECTOR

Resources

Power generation in Nigeria relies primarily on hydro resources, coal, oil and natural gas. Nigeria currently has a total of 2,000MW of installed hydro capacity with this being generated from large-scale power plants such as Kainji (720 MW), Jebba (570 MW), and Shiroro (600 MW) (REN21, 2014a). In 2012, these energy-generating plants cumulatively accounted for 16.2% of Nigeria's grid-connected installed capacity. Small-scale hydropower has also significantly grown in Nigeria – accumulating to a total of 40MW installed capacity as at 2014 (REN21, 2014a).

Current oil reserve is about 37.1 billion barrels, with a daily production of 2.5 billion barrels (BPD) per day (BP, 2014). Oil –fired generation contributed an estimated 30% to grid-connected installed capacity in 2014 (ECREEE, 2012; REN21, 2014a). Nigeria ranks as the fourth-largest gas exporter in the world with an estimated 170 trillion standard cubic feet (5,210 billion cubic metres) of associated and non-associated gas reserves (OPEC, 2014). Natural gas accounted for 50% of electricity generation in 2014 (BP, 2014). Coal and Lignite are estimated to be at about 2.7 billion tonnes (1.882 billion toe) and this is mainly used for industrial heating in cement production and railway transportation (Dayo, 2008).

Infrastructure

Nigeria's energy technological landscape consists of twenty-three power generation stations owned by nineteen-generation companies (GENCOs) and eleven distribution companies (DISCO). Fifteen of those originated during the era of the defunct Nigerian Electricity Power Authority (NEPA) while the remaining eight power stations are Independent Power Projects (IPPS) developed via public/private partnerships (BPE, 2006; Ley et al., 2014). In 2011, Nigeria's power generation capacity was pegged at 6, 100MW with a recorded peak generation of 4, 517.6 MW in December 2012. Reports from the Nigerian Electricity Regulatory Company (NERC) suggests that out of the 19,407 MW licenced on-grid power generation capacity in Nigeria, 13,308 MW are currently functional while the remaining 5099 are currently in the planning phase or under construction. In contrast, off-grid licences cover an embedded generation capacity of 49MW with a production capacity of 305 MW (NERC, 2011).

TABLE 2.3. Nigeria's energy balance 2011 in thousand tonnes of oil equivalent

Indicators	Coal	Crude Oil	Oil Products	Natural gas	Hydro	Biofuels and waste	Electricity	Total
Production	28	116289	0	34641	460	108606	0	260024
Imports	0	0	8405	0	0	0	0	8405
Exports	0	-112926	-534	-20179	0	0	0	-133639
International Marine Bunkers	0	0	-371	0	0	0	0	-371
International aviation bunkers	0	0	-322	0	0	0	0	-322
Stock Changes	0	224	386	0	0	0	0	610
TPES	28	3587	7566	14462	460	108606	0	134708
Transfers	0	95	-85	0	0	0	0	10
Statistic differences	0	0	1	-1032	0	0	0	-1031
Electricity Plants	0	0	0	-5382	-460	0	2614	-3228
Oil Refineries	0	-3319	3315	0	0	0	0	-3
Coal Transformation	0	0	0	0	0	0	0	0
Other Transformation	0	0	0	0	0	-8481	0	-8481
Energy Industry own Use	0	0	-302	-4224	0	0	-91	-4617
Losses	0	-363	-57	0	0	0	-421	-842
Total Final Consumption	28	0	10438	3824	0	100124	2102	116516
Industry	28	0	429	2483	0	4045	349	7334
Transport	0	0	7302	0	0	0	0	7302
Other	0	0	2679	0	0	96079	1753	100511
Residential	0	0	526	0	0	93397	1204	95127
Commercial and Public Services	0	0	1	0	0	2683	549	3232

TABLE 2.3. (continued)

Indicators	Coal	Crude Oil	Oil Products	Natural gas	Hydro	Biofuels and waste	Electricity	Total
Agriculture and Forestry	0	0	4	0	0	0	0	4
Fishing	0	0	0	0	0	0	0	0
Non-Specified	0	0	2148	0	0	0	0	2148
None-energy use	0	0	28	1341	0	0	0	1370
chemical and petrochemical	0	0	0	1341	0	0	0	1341

Source: (IEA, 2017)

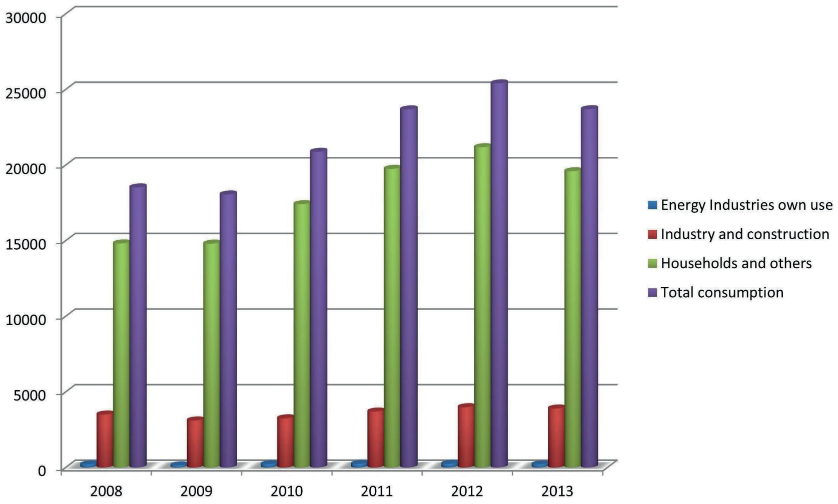

FIGURE 2.1 Sectoral consumption of energy in Nigeria with 13% projected growth rate
Source: (Sambo, 2009)

As of 2012, transmission lines in Nigeria stretched over 12, 300km, with two connecting substations operational (105 132 kV and 32 330kV) and over 23,000 km of distribution network available. Transmission and distribution losses within Nigeria's energy infrastructure have been pegged between 11 and 17.5% (Ley et al., 2014; Power Sector, 2012). This has domino effects on other key sectors of the economy. Putting this in perspective, manufacturing industries in Nigeria lost between 7.8 and 8.5 productive hours per day in 2013 due to power outages (MAN, 2013).

This assertion was buttressed by a recent World Bank report, which identified that businesses in Nigeria tend to experience blackouts and outages on an average of 240 hours per month resulting in a 7% sales loss. As a consequence of this, virtually all private businesses in Nigeria have resorted to the use of highly expensive off-grid generator ((World Bank, 2014). Furthermore, Nigerian households and businesses on an average spend an estimated USD 14 billion per annum on diesel and petroleum products to power their generators due to unreliable electricity supply (Bazilian & Onyeji, 2012; Nwachukwu & Chike, 2011).

Presently, technical, commercial and collection losses within a five-year period have been aggregated to be between 35 to 40% while wheeling capacity of grid connection has been placed at 4,500 MW. Going by the statistical differences in table 2.3, it is clear that high losses of energy remain unaccounted for in the course of transformation from primary resources to electricity.

Based on these findings, several electricity Distribution Companies in Nigeria (DISCO) have set numerous targets on how to reduce this figure significantly (World Bank, 2014). In sum, the data on infrastructure does not only suggest inefficiency in the energy system, but also more likely of corruption i.e. diversion of resources for undisclosed purposes.

TABLE 2.4. Energy Generation Plants in Nigeria

Site/station	Type	Installed Capacity (MW)	Available Capacity (MW)	Operational capacity (MW)
Afam IV-V	NIPP	724	3	2
Delta	NIPP	480	462	374
Geregu	Privatised PHCN	450	328	179
Egbin	IPP	1,320	941	539
Rivers	IPP	136	0	0
Sapele	NIPP	954	403	180
Shiroro	Privatised PHCN	600	508	153
Kainji	NIPP	720	431	173
Jebba	IPP	570	388.21	262
Geregu	NIPP	450	159	179
Olorunsogo	Privatised PHCN	760	260	171
Alaoji	IPP	720	158	67
Ihovbor	NIPP	434	374	182
Omotosho NIPP	NIPP	500	306	169
Omotosho gas	Privatised PHCN	335	280	163
Asco	IPP	294	270	0
Okpai	IPP	900	536	375
Afam VI	Privatised PHCN	685	587	455
AES Barge	Privatised PHCN	180	175	0
Ibom	Privatised PHCN	190	91	76
Trans Amadi	NIPP	150	0	0
Odukpani	NIPP	561	234	64
Omoku	Privatised PHCN	110	0	0

Source: NERC, LSEB (2014)

Institutions

Following a brief overview of Nigeria's energy infrastructural landscape, this section provides a brief summary of the institutional architecture. Below is a list of core institutions and organisations governing and regulating power generation, transmission and distribution in Nigeria.

The Federal Ministry of Petroleum Resources and NNPC: NNPC dominates Nigeria's energy landscape. The organisation operates under the ministry of petroleum resources. The Ministry of Petroleum Resources is responsible for energy planning and policy while the NNPC deals with the development of upstream and downstream sectors of the oil industry. The NNPC also acts as a supervisor and regulator of the oil and gas sector in Nigeria.

Nigerian Petroleum Development Company (NPDC): NPDC is a subsidiary of NNPC. The sub-agency is responsible for the exploration and production of crude oil and natural gas. In recent times, it has ensured the supply of gas for power stations across Nigeria.

The Federal Ministry of Power (FMP): The main responsibility of the FMP is to initiate, formulate coordinate and implement programmes and policies tailored to the development of Nigeria's electricity sector. The FMP has the mandate to develop a functional and robust power sector to promote Nigeria's socio-economic growth.

Nigerian Electricity Regulatory Commission (NERC): NERC is mandated to regulate, monitor and ensure standard operating procedures, rules, regulations, and ensure strict compliance to market structures within the electricity sector. NERC plays a significant role in Nigeria's electricity consumer protection process. It ensures that prices are fair, disputes get resolved, and services become efficient. It assesses the applications and eligibilities of companies interested in power generation and sale in Nigeria. Importantly, it ensures competitive electricity trading, sets long-term tariff paths while defining the Multi-Year Tariff Order, which sets generation and consumer electricity prices

Energy Commission of Nigeria (ECN): The ECN is the federal executive arm in charge of energy planning, policy and implementation. The ECN coordinates all research, planning, strategies and policy activities of Nigeria's energy sector. The ECN has been a strong promoter of renewable energy development in Nigeria through its numerous research centres across Nigeria. Based on its mandate, the ECN serves as an advisory body to the government on energy related issues. It also gathers and disseminates information regarding Nigeria's national energy strategy. Lastly, it is a technological hub for the development of energy solutions in Nigeria.

Power Holding Company of Nigeria (PHCN): PHCN emerged as a replacement for the defunct NEPA. Its mandate is to ensure the generation, transmission and distribution of electricity across the country. It also assumes responsibility for the financial development of the electricity sector. PHCN has been unbundled into six-generation companies, one Transmission Company and eleven distribution companies to ensure private sector involvement and aid effective generation and supply of electricity in Nigeria.

Nigerian Bulk Electricity Trading PLC (NBET): NBET is a public liability company owned by the Federal Government of Nigeria, incorporated under the aegis of the Bureau of Public Enterprises and the Ministry of Finance. NBET emerged as part of the 2010 "Roadmap for Power Sector Reform" as a trading license with authority on electricity licenses on bulk purchases and resale. Its main responsibility is to engage, purchase and re-sell electrical power and supplementary services from energy generation companies and independent power producers.

Rural Energy Agency (REA): REA was established with a mandate to mobilise capital for a sustainable private sector driven rural electricity development in Nigeria. Its main function is to coordinate, promote and implement proposed projects on rural electrification in Nigeria. REA also manages rural electricity funds while regulating electrification in rural areas. Through its financial structures, REA projects are designed to ensure grid expansion and the deployment of mini-grids and off-grids renewable energy solutions in rural areas

Presidential Taskforce on Power (PTFP): The PTFP's responsibilities covered the provision of technical, planning, implementation and evaluation services towards the development of the electricity sector's roadmap. It was structured to operate as the leading agent evaluating the inter-agency interaction and performance of the Presidential Action Committee on Power reform agenda while providing the required presidential backing to support the agenda.

National Power Training Institute of Nigeria (NAPTIN): NAPTIN was officially registered as a legal entity in September 2009 to train power sector personnel in Nigeria. It is a sub-agency under the FMP tasked with the mandate to produce a National Power Training Policy document for the ministry of power.

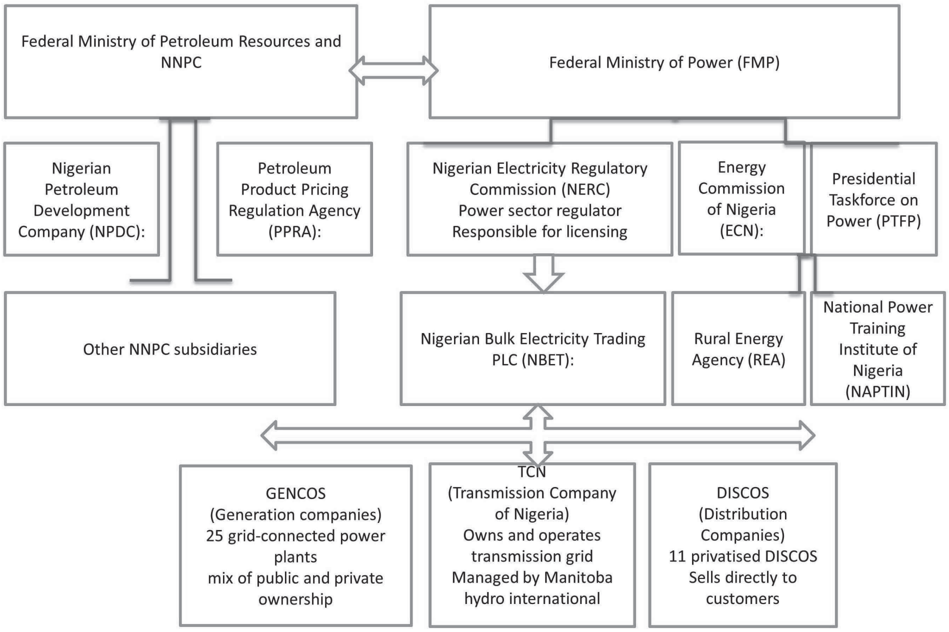

FIGURE 2.3 Institutional relationship between energy organisations
Source: Author's compilation

2.4 NIGERIA'S ENERGY REFORMS: SECURING THE POLICY SPACE FOR RENEWABLE ENERGY

At the end of the military rule in 1999, a series of energy and power sector reforms were launched to deal with already discussed energy challenges in Nigeria. Nigeria's post-military energy reform started in 2001 with the introduction of National Electric Power Policy (NEPP) (Dayo, 2008; Isma et al., 2014). NEPP's recommendations for the power sector were in three phases. i) A transition stage, which involved the liberalisation and unbundling of the power sector. ii) The stabilisation phase, which involved the restructuring and sale of energy companies, creation of competitive markets, energy trading among generation enterprises and the promotion of private sector participation in the power sector. iii) The optimisation and long-term phase envisaged a fully deregulated and developed energy market where consumers can afford real electricity costs with little or no subsidies (Aroge & Meisen, 2014; BPE, 2006; Oyedepo, 2012).

The development of the National Energy Policy in 2003 became a central component of the reform process. This policy document was the first to explicitly incorporate the development of renewable energy in Nigeria's energy mix. The policy covers the exploitation, development and optimisation of all energy resources (renewable and non-renewable) in Nigeria. It also focused on issues such as energy efficiency, energy financing and rural electrification (IISD, 2012a). Based on the NEPP and NEMP's recommendations, a supporting legislation (Electricity Power Sector Reform Act, 2005) was signed into law in 2005. The Electricity Power Sector Reform Act has five main components. The privatisation of NEPA, the creation of NERC, the creation of a wholesale electricity market, the creation of a rural electrification agency and the entry of independent power producers within the electricity market (BPE, 2006; ECN, 2014b). As part of these overarching reform process, NEPA was de-registered; with its assets and liabilities transferred to the Power Holding Company of Nigeria (PHCN).

In 2006, the Federal Ministry of Power and Steel released the Renewable Electricity Policy Guidelines (REPG). This policy document covers targets on renewable electricity markets expansion to at least five percent of total electricity generation by 2016, the construction of stand-alone renewable electricity grids in rural areas and the creation of the Rural Electrification Trust Fund (RETF) (ECN, 2014b). By 2007, the Nigerian government launched its National Biofuels Policy in line with its Automotive Biofuels Programme. The biofuels model is centred exclusively on the state-controlled production of energy crops to promote a national biofuel ethanol industry which caters to Nigeria's fuel transport needs (NNPC, 2007). Other attempts at reforms include the introduction of a "Roadmap for Power Sector Reform" in 2010, the inclusion of a national energy strategy in Nigeria's Vision 20:2020 document submitted in 2010, and the review and update of the Renewable Energy Master Plan (REMP) in 2012 (ECN, 2009, 2014b; Power Sector, 2012). Also in 2012, the National Renewable Energy and Energy Efficiency Policy (NREEEP) was developed alongside a feed-in tariff methodology, while a draft of the Rural Electrification Strategy and Implementation Plan (RESIP) was published in 2014 (ECN, 2014a).

TABLE 2.5. Energy reforms, policies and whitepapers in Nigeria

Year	Policy Core	Policy Instrument	Effects	Gaps
2004	National Energy Policy	Targets and timelines in the short and long terms	Creation of the National Integrated Power Project (NIPP)	Need to be passed into law
2005	Electricity Power Sector Reform Act	Establishment of Nigerian Electricity Regulatory Commission (NERC)	Development of Multi-Year Tariff Order (MYTO II)	Need for review
2006	Rural Electrification Plan	Establishment of rural electrification agency	Increase in transnational partnerships	Needs to incorporate local realities
2006	Renewable Electricity Policy Guidelines	Renewable Electricity Action Programme	Development of national research centres	
2007	National Energy Master Plan	Focus on alternative sources of energy	competition in the generation of electricity	
2007	Biofuel Policy Incentive	10 percent ethanol and 20 percent biodiesel blend (E10 and B20)	Creation of a renewable energy division	Need for commercialisation and legislation
2008	Electricity Master Plan	Increased mandate on the accessibility to natural gas	Unbundling of the electricity sector, domestic utilisation of gas	
2009	Rural Electrification Policy Paper	Provision of credit enhancement instruments	Awareness raising	
2009	Vision 20-20 Energy Sector	Creation of the Nigerian Bulk Electricity Trading Plc	Establishment of the National Power Training Institute of Nigeria	Reduce overlaps in ministerial and parastatal duties
2012	Renewable Energy Master Plan	Reduction in energy vats and taxes, targets, pioneer status, import duty waivers and insurance	Increase in solar and wind businesses in Nigeria, Promotion of public/private partnerships	
2012	National Renewable Energy and Energy Efficiency Policy	Minimum energy performance standards (MEPS), Tendering, feed-in tariffs, targets, public investments	Dissemination of efficient lights, Awareness raising, 1 million CFLs LED lamp distribution	Need to introduce a legislative act, need to increase access to financing
2012	National Rural Electrification Strategy	Grants and funds from subsidy purse	Extension of grid connection to rural areas	Needs to correlate with state developed goals

TABLE 2.5. (continued)

Year	Policy Core	Policy Instrument	Effects	Gaps
2014	Rural Electrification Strategy and Implementation	Rural electrification fund	Funding of 750,000 clean cookstoves	Need for transparency and accountability

Source: Author's compilation

One of the main features of the Nigerian energy sector is that while it is apparently locked-in, it is also under tremendous external pressure because it does not provide growing amount of reliable power for development. However, despite a significant number of efforts made over the last two decades (as described in section 2.4) to try and bring the transition to an effective power system, these reforms have been difficult to bring to fruition. Understanding why these efforts have failed is as important as trying to understand the current changes. Following Braun (1992: 214) thought, "In the analysis of technological development and policy trajectories, understanding why innovations failed are vital and perhaps even more critical than exploring why it succeeded." This is because the likelihood of failure is more recurrent and plausible than success. Therefore there is an implicit knowledge in failure that can be gleaned (Smil, 2010). Thus, in this context, it is critical to examine the interplay between actors, institutions and resources within Nigeria's energy system and how their political interests and technological preferences become embedded in the society. To this end, in Chapter 3, the thesis argues that the incorporation of the multi-level socio-technical perspective and rentier theory can provide a pathway to the analyses of techno-political factors and influences in Nigeria's energy system. With all sense of optimism, this might contribute to the development of a solid conceptual framework for case comparisons while also proffering tangible insights for coherent policy-making.